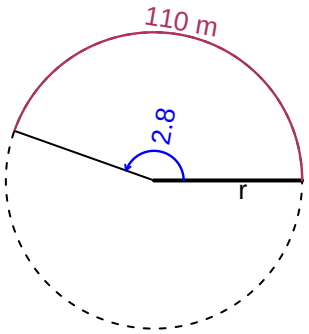
Name: Date:

Trig Final (Solution v6)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 110 meters. The angle measure is 2.8 radians. How long is the radius in meters?

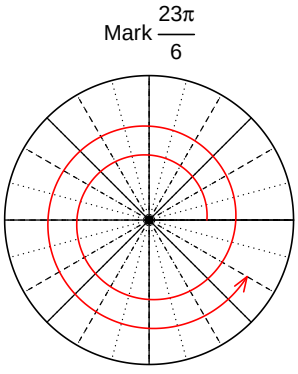


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

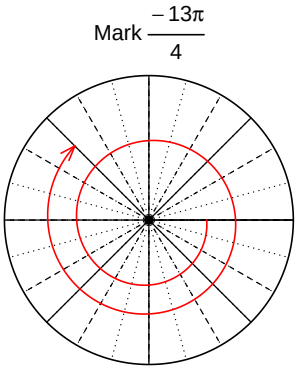
$r = 39.29$ meters.

Question 2

Consider angles $\frac{23\pi}{6}$ and $\frac{-13\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{23\pi}{6}\right)$ and $\cos\left(\frac{-13\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(23\pi/6)$



Find $\cos(-13\pi/4)$

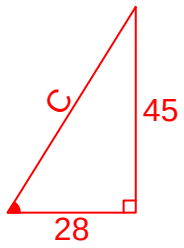
$\sin(23\pi/6) = \frac{-1}{2}$

$\cos(-13\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{-45}{28}$, and θ is in quadrant IV, determine an exact value for $\cos(\theta)$.

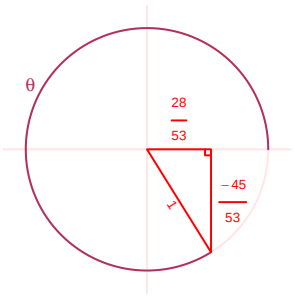
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$28^2 + 45^2 = C^2$$
$$C = \sqrt{28^2 + 45^2}$$
$$C = 53$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\cos(\theta) = \frac{28}{53}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 6.85 Hz, an amplitude of 8.76 meters, and a midline at $y = 4.12$ meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -8.76\sin(2\pi 6.85t) + 4.12$$

or

$$y = -8.76\sin(13.7\pi t) + 4.12$$

or

$$y = -8.76\sin(43.04t) + 4.12$$